APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/893,065	06/28/2001	Walter Vincent Dixon	RD-27,478	4211

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
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NISKAYUNA, NY 12309

EXAMINER
AKHAVANNIK, HUSSEIN

ART UNIT	PAPER NUMBER
2621	

DATE MAILED: 10/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

	Application No.	Applicant(s)
Office Action Summary	09/893,065	DIXON ET AL.
	Examiner	Art Unit	
	Hussein Akhavannik	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *19 September 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All   b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1.   The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2.   Claims 7 and 20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Referring to claims 7 and 20, it is not understood how the first though fourth steps are applied at the same time to the raw data when, in claims 1 and 14, the second step of adjusting is performed on the offset corrected data generated in the first step. Similarly, in claims 3 and 14, the third step of adjusting a window is performed on the gain corrected image generated in the second step and the fourth step of packing is performed on the output image generated in the third step. As claimed, each step requires the image output from the previous step to perform its function and it is not understood how the first through fourth step could be applied at the same time to the raw data (parallel), when the step are performed in sequence (serial).

Claim Rejections - 35 USC § 102

3.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4.   Claims 1-2 and 12-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Shroy, Jr. et al (U.S. Patent No. 4,891,757 herein "Shroy").

Referring to claim 1, which is representative of claim 13,

i.   Correcting the raw images with respect to an offset image to generate an offset

corrected image is illustrated by Shroy in figure 5 by the offset correction 126. Shroy

explains that the offset image corresponds to the offset level of a particular detector and

the raw image corresponds to the image pixel data value in column 12, lines 21-25.

ii.   Adjusting a level of the offset corrected image with respect to a gain adjust to

generate a gain corrected image is illustrated by Shroy in figure 5 by the gain correction

128.

Referring to claim 2, adjusting the level of offset employing saturation arithmetic to clip

the level of the offset corrected image is explained by Shroy in column 12, lines 21-25.

Referring to claim 12, the gain adjust comprising a composite image acquired by

calibration is explained by Shroy in column 12, lines 26-30, wherein the gain factor is

determined for the individual detector element assigned to the pixel.

Claim Rejections - 35 USC § 103

5.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are
> such that the subject matter as a whole would have been obvious at the time the invention was made to a person
> having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the
> manner in which the invention was made.

6.   Claims 3, 7-8, 14, 18, 20, and 22-23 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Shroy in view of Bruijns et al (U.S. Patent No. 5,974,113).

Referring to claim 3,

i.   Adjusting a window of the gain corrected image with respect to a reference window to generate an output image is not explicitly explained by Shroy. However, Bruijns et al explain adjusting a sub-image, captured by an x-ray examination device, to correct brightness values by an offset correction factor and a gain correction factor in column 2, lines 30-38. Bruijns et al explain that each sub-image is adjusted so that a composite image made up of the sub-images does not exhibit artifacts and is of higher quality in column 2, lines 10-21. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust a window of the gain corrected image with respect to a reference window to generate an output image, as suggested by Bruijns et al, in the system of Shroy, because the output image would be of higher quality.

ii.   Packing the output image into a register for display is illustrated by Shroy in figure 2 by the monitor 26, which receives information for display from the digital processing unit 23 (corresponding to a register).

Referring to claim 7, which is representative of claim 20, the raw data comprising cardio images or a fluoro-rad image and wherein the first through fourth steps are applied at the same time to the raw data is explained by Shroy in column 3, line 66 to column 4, line 5, wherein the raw image is a fluoroscopy radiographic image.

Referring to claim 8, which is representative of claim 22,

i.   The second step of adjusting including a linear transformation is explained by Shroy in column 12, lines 26-30, wherein the gain factor is multiplied (linear transform) by the pixel data value.

ii.   The third step of adjusting employing saturation to adjust the window is explained

by Shroy in column 12, lines 21-25, wherein saturation arithmetic is used to adjust pixel

values, so that the pixel values will not be negative.

Referring to claim 14,

i.   Correcting the raw images with respect to an offset image to generate an offset

corrected image corresponds to claim 1i.

ii.   Adjusting a level of the offset corrected image with respect to a gain adjust by

employing saturation arithmetic to clip the level of the offset corrected image to generate

a gain corrected image corresponds to claim 1ii and claim 2.

iii.   Adjusting a window of the gain corrected image with respect to a reference

window to generate an output image corresponds to claim 3i.

ii.   Packing the output image into a register for display corresponds to claim 3ii.

Referring to claim 18, the gain adjust comprising a composite image acquired by

calibration corresponds to claim 12.

Referring to claim 23, software for controlling the operation of the processor to perform

the correcting, first adjusting, second adjusting, and packing is illustrated by Shroy in figure 2 by

the digital processing unit 23, which inherently contains software to control the processor.

7.   Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shroy in

view of Maeda et al (U.S. Patent No. 6,421,772).

Referring to claim 9, the raw image comprising an N pixel sub-image, wherein the N

pixel sub-image is divided into M sets of N/M pixels each, wherein N is an integer multiple of

M, and wherein the first and second steps are applied to each of the M sets and the M sets are

simultaneously processed in parallel by the first and second steps is not explicitly explained by

Shroy. However, Maeda et al illustrate dividing a 64-pixel raw image sub-image into 4 sets and

simulatniously processing each set in figure 5. Maeda et al explain the computer for performing

the parallel processing in column 5, lines 51-59. Maeda et al explain that parallel processing of

the image enhances the speed of the image processing operation in column 1, lines 41-52.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention

was made to divide a raw image into N-pixel sub-images and divide the sub-image into N/M

pixels each to simultaneously process the pixels in parallel, as suggested by Maeda et al, in the

system of Shroy because the speed of the image processing would be improved.

Referring to claim 10, using single instruction multiple data (SIMD) instruction

architecture and wherein the transformation exploits the SIMD architecture whereby branches to

clip the offset corrected image are avoided with the saturation arithmetic is not explicitly

explained by Shroy. Shroy does explain saturation arithmetic to clip the offset corrected image

in column 12, lines 21-25. However, Shroy does not explain using SIMD instruction

architecture. Maeda et al explain SIMD instruction architecture in column 7, lines 56-61, in

order to control processing element arranged in matrix form. Therefore, it would have been

obvious to one of ordinary skill in the art at the time the invention was made to use SIMD

instruction architecture, as suggested by Maeda et al, to control the processing of the system of

Shroy because images are ordered in matrix form and the speed of the image processing would

be improved by SIMD instruction architecture.

8.   Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shroy in view of

Granfors et al (U.S. Patent No. 5,657,400).

Referring to claim 11, the raw images comprising x-ray images and the offset image

being an x-ray image corresponding to the absence of the x-rays is not explicitly explained by

Shroy. Shroy does explain that the raw images are x-ray images in column 7, lines 40-51 and

explains that the offset image corresponds to an offset level of a detector in column 12, lines 21-

25. However, Shroy does not explicitly explain that the offset image is an x-ray image

corresponding to the absence of the x-rays. Granfors et al explains that an offset image is created

from images obtained in the absence of x-ray exposure in column 3, lines 44-45. Such an image

will correspond to the offset of the detector used in the system of Shroy. Therefore, it would

have been obvious to one of ordinary skill in the art at the time the invention was made for the

raw images being x-ray images and the offset image being an x-ray image corresponding to the

absence of the x-rays, as suggested by Granfors et al, in the system of Shroy because the offset of

the detector can be measured accurately.

9.   Claims 4-5, 15-16, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over

Shroy in view of Bruijns et al, and further in view of Maeda et al.

Referring to claim 4, which is representative of claim 15, the raw image comprising an N

pixel sub-image, wherein the N pixel sub-image is divided into M sets of N/M pixels each,

wherein N is an integer multiple of M, and wherein the first and second steps are applied to each

of the M sets and the M sets are simultaneously processed in parallel by the first and second

steps is not explicitly explained by Shroy or Bruijns et al. However, Maeda et al illustrate

dividing a 64-pixel raw image sub-image into 4 sets and simulatniously processing each set in

figure 5. Maeda et al explain the computer for performing the parallel processing in column 5,

lines 51-59. Maeda et al explain that parallel processing of the image enhances the speed of the

image processing operation in column 1, lines 41-52. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to divide a raw image into N-pixel sub-images and divide the sub-image into N/M pixels each to simultaneously process the pixels in parallel, as suggested by Maeda et al, in the system of Shroy and Bruijns et al because the speed of the image processing would be improved.

Referring to claim 5, which is representative of claim 16, N equals 64 and M equals 4 corresponds to claims 4 and 15, respectively, wherein Maeda et al illustrate a 64 pixel sub-image divided into 4 groups.

Referring to claim 21, using single instruction multiple data (SIMD) instruction architecture and wherein the transformation exploits the SIMD architecture whereby branches to clip the offset corrected image are avoided with the saturation arithmetic is not explicitly explained by Shroy or Bruijns et al. Shroy does explain saturation arithmetic to clip the offset corrected image in column 12, lines 21-25. However, Shroy does not explain using SIMD instruction architecture. Maeda et al explain SIMD instruction architecture in column 7, lines 56-61, in order to control processing element arranged in matrix form. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use SIMD instruction architecture, as suggested by Maeda et al, to control the processing of the system of Shroy and Bruijns et al because images are ordered in matrix form and the speed of the image processing would be improved by SIMD instruction architecture.

10.   Claims 6, 17, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shroy in view of Bruijns et al, and further in view of Granfors et al.

Referring to claim 6, which is representative of claim 19, separately processing any bad pixels of the raw image is not explicitly explained by Shroy or Bruijns et al. However, Granfors et al explain correcting bad pixels from a raw image in column 4, lines 24-32. Granfors et al explain that bad pixels interfere with the visualization of the x-ray image in column 1, lines 47-54. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to process bad pixels of the raw image as suggested by Granfors et al, in the system of Shroy and Bruijns et al, because the raw image quality would be improved and thereby, the future analysis of the medical image would be more accurate.

Referring to claim 17, the raw images comprising x-ray images and the offset image being an x-ray image corresponding to the absence of the x-rays is not explicitly explained by Shroy or Bruijns et al. Shroy does explain that the raw images are x-ray images in column 7, lines 40-51 and explains that the offset image corresponds to an offset level of a detector in column 12, lines 21-25. However, Shroy does not explicitly explain that the offset image is an x-ray image corresponding to the absence of the x-rays. Granfors et al explains that an offset image is created from images obtained in the absence of x-ray exposure in column 3, lines 44-45. Such an image will correspond to the offset of the detector used in the system of Shroy. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made for the raw images being x-ray images and the offset image being an x-ray image corresponding to the absence of the x-rays, as suggested by Granfors et al, in the system of Shroy and Bruijns et al because the offset of the detector can be measured accurately.

Conclusion

11.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Duarte (U.S. Patent App. Pub. No. 2002/0,114,530) – To exhibit selecting a portion (130) of an unprocessed image (120) to enhance (150) as illustrated in figure 2.

Spahn (U.S. Patent No. 6,477,228) – To exhibit correcting the offset and gain of an image as explained in column 5, lines 1-16.

Kawai (U.S. Patent No. 6,034,789) – To exhibit correcting the offset and gain (3) of an image as illustrated in figure 1.

Petrick et al (U.S. Patent No. 6,457,861) – To exhibit correcting the offset and gain of an image as explained in the abstract.
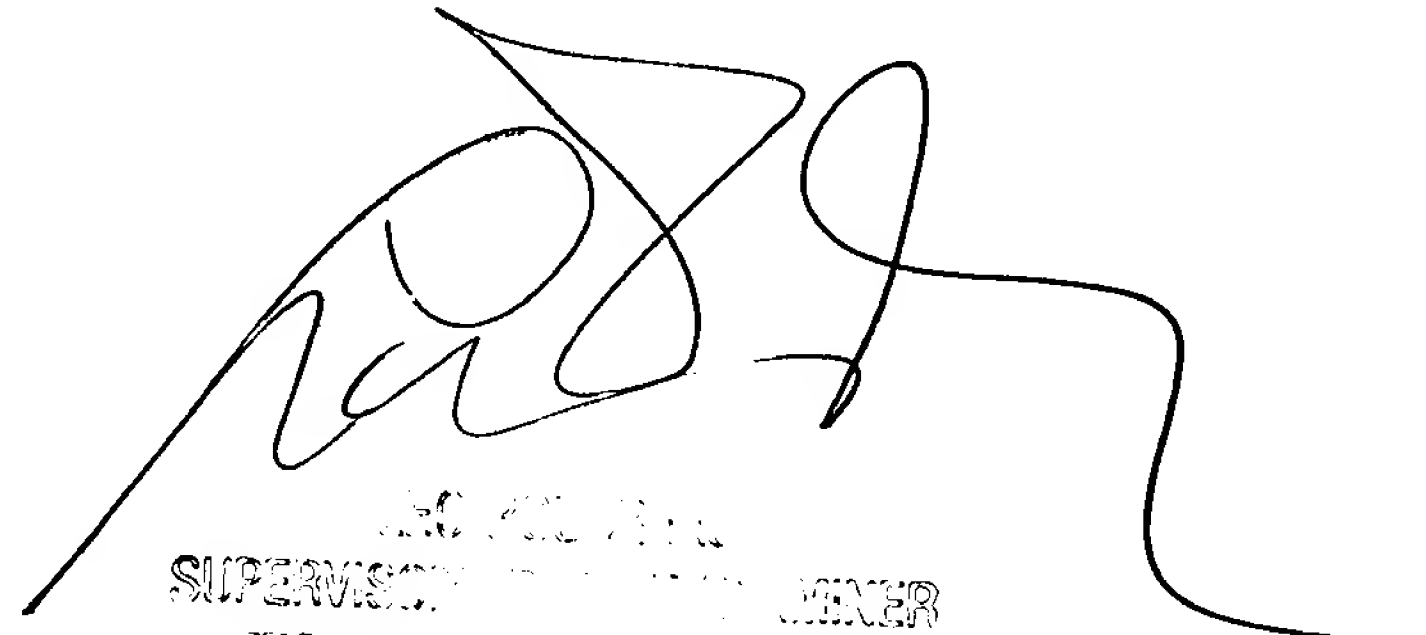
12.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hussein Akhavannik whose telephone number is (703)306-4049. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H. Boudreau can be reached on (703)305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent

Application Information Retrieval (PAIR) system. Status information for published applications

may be obtained from either Private PAIR or Public PAIR. Status information for unpublished

applications is available through Private PAIR only. For more information about the PAIR

system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hussein Akhavannik
September 30, 2004